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FOSSIL TURTLES OF MONGOLIA: SECOND CONTRIBUTION[1]

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INTRODUCTION

The present paper embodies the results of my study of fossil turtles collected in Mongolia by the 1930 Asiatic expedition of The American Museum of Natural History and completes my investigations on the entire Mongolian Chelonian collection, as those secured prior to 1930 were discussed in a previous communication.[3]

Of outstanding importance in the present collection is an assemblage of fourteen trionychids, half of which were found so closely intermingled as to be taken up intact in one large block of matrix (see Fig. 7). Several of these had not only the carapace and plastron preserved but the skull, vertebrae, limbs and feet. Study has disclosed that all pertain to a single species, and, as both juvenile and adult individuals are present, the assemblage probably constitutes the most comprehensive representation of a single extinct species of a trionychid turtle ever discovered.

The presence of a single neural between the first pair of costals and the absence of marginal bones indicate the affinities of these specimens to lie in the genus *Amyda*. Since they represent an undescribed species, the name **gregaria** is proposed, in reference to their gregarious habits.

Family TRIONYCHIDÆ

Amyda gregaria, new species

TYPE:—A.M. No. 6734, consists of carapace, plastron and much of skeleton lacking the skull. Collected in 1930 by the Central Asiatic Expedition.

PARATYPES:—A. M. No. 6735, consists of skull, lower jaws and portions of carapace, plastron and skeleton. A. M. No. 6736 is a nearly complete skeleton of a juvenile individual. Both collected in 1930 by the Central Asiatic Expedition.

LOCALITY:—Camp Margetts, 25 miles southwest of Iren Dabasu, Inner Mongolia.

HORIZON:—Houldjin, Middle Oligocene.

DIAGNOSIS:—Carapace much longer than wide, truncated posteriorly in the adult; seven or eight neurals, eighth much reduced. Length of nuchal more than half the width of carapace and in the adult not overlapping the rib ends of the first pair of

[1]Publications of the Asiatic Expeditions of The American Museum of Natural History. Contribution No. 119.

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[3]Gilmore, Charles W. 1931. 'Fossil Turtles of Mongolia.' Bull. Amer. Mus. Nat. Hist., LIX, Art. IV, pp. 213–257.

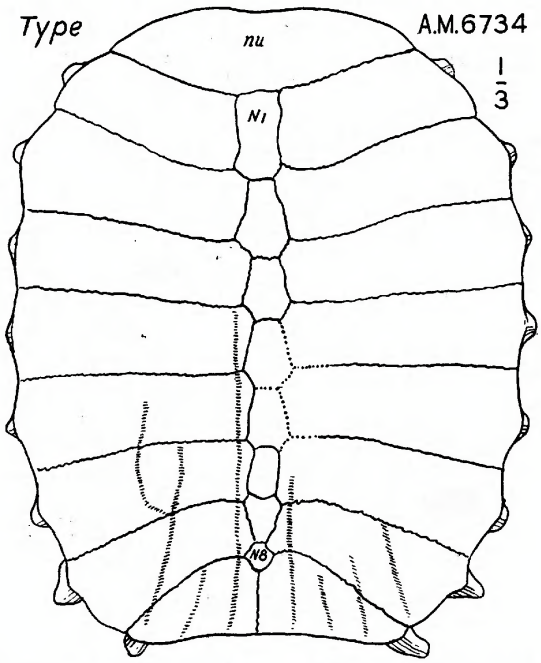

Fig. 1. Carapace of *Amyda gregaria*, new species. Type. A. M. No. 6734. One-third natural size.

N_1, N_8, neurals one and eight respectively; *nu*, nuchal.

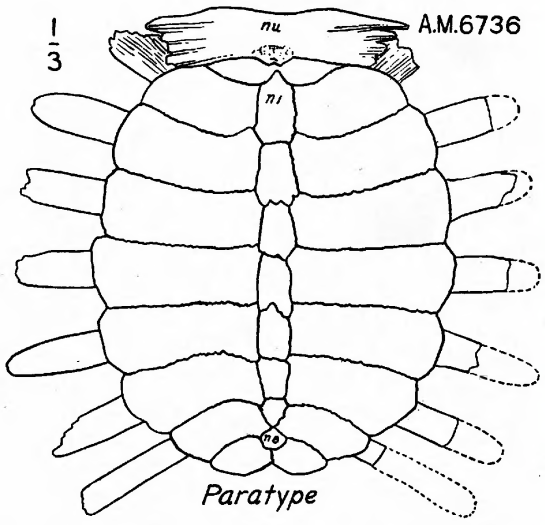

Fig. 2. Carapace of *Amyda gregaria*, new species. Paratype. Juvenile. One-third natural size. A. M. No. 6736.

N_1, N_8, neurals one and eight respectively; *nu*, nuchal.

costals; opposite sides of carapace parallel. Snout on the skull shorter than the diameter of the orbit; length of supratemporal fossa less than the longitudinal diameter of orbit. Orbit nearer the temporal than the nasal fossa.

The specimen selected as the type of *Amyda gregaria* is probably adult although not an aged individual, as indicated by the open sutures of all parts of the carapace. It was found not far removed from the group shown in figure 7.

The carapace is sub-elliptical in form, broadly rounded in front and decidedly truncate behind. In the juvenile specimens the posterior end is rounded with a slight median notch as shown in figure 2. Anteroposteriorly the carapace appears to have been but slightly arched, but transversely it is strongly convex, especially on the outer third of the costals. In a straight line the length is 230 mm.; the greatest width is 195 mm. The other adults shown in figure 7 vary in length from 232 mm. to 266 mm., measured as they lay in the matrix.

In the type there are eight neurals, and both juveniles carry a similar number. In A.M. Nos. 6728, 6729 and 6731 (see Fig. 7), however, there are only seven, but this is a variation often observed in other species of the Trionychidae. The shell of this species is moderately thin.

The neural series of the several individuals are remarkably similar in shape and general proportions. The first neural is wider behind than in front; the next four are coffin-shaped; the sixth usually quadrangular; the seventh triangular; and the reduced eighth, when present, is subcircular in outline and usually in contact with the seventh. Their dimensions are given in the accompanying table:

COMPARATIVE MEASUREMENTS OF NEURALS

Neurals	Length		Width	
	Type A. M. No. 6734	Paratype A. M. No. 6736	Type A. M. No. 6734	Paratype A. M. No. 6736
	mm.	mm.	mm.	mm.
1	32	25	19	13.5
2	25	22	19	16
3	22.5	20	17	15
4	....	19	....	13
5	....	18	....	10.5
6	18.5	15	10	10
7	16	10	12	9
8	10	7.5	9.5	8.5

The nuchal of the type has an antero-posterior extent of 30 mm. and measures about 115 mm. from side to side. The anterior border is shallowly concave on the median line. In none of the adult specimens do the ends overlap the first costal ribs, although they do so in the juvenile specimen shown in figure 2.

The form and relative proportions of the costal bones are plainly shown in figures 1 and 2. Excepting the eighth pair, the costals are remarkably uniform in all available specimens. In specimens A. M. Nos. 6729 and 6731 the eighth pair of costals are much reduced trans-

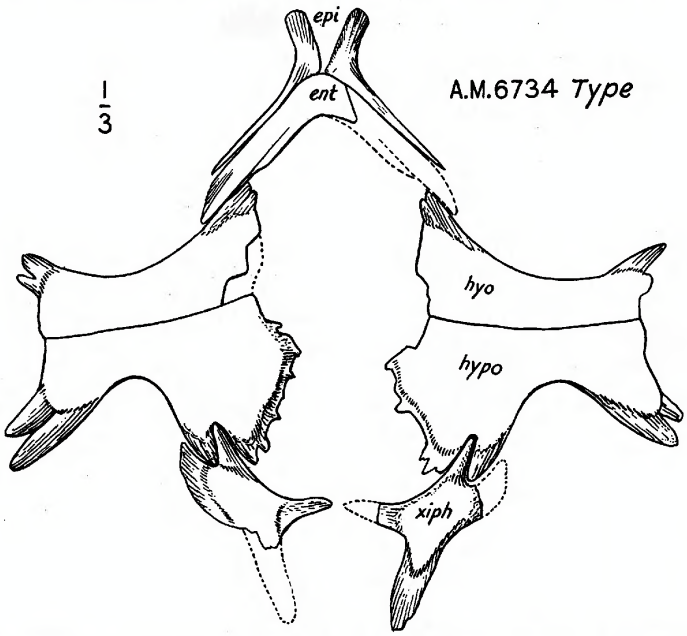

Fig. 3. Plastron of *Amyda gregaria*, new species. Type. A. M. No. 6734. One-third natural size.

Ent, entoplastron; *epi*, epiplastron; *hyo*, hyoplastron; *hypo*, hypoplastron; *xiph*, xiphiplastron.

versely, in this respect being intermediate between the type and the juvenile specimens. The free borders of the costals are steeply beveled off to an acute lower edge. In the type some of the posterior ribs project 38 mm. beyond the edge of the carapace. The entire upper surface of the carapace is beautifully sculptured (see Fig. 8). The sculpture consists of a series of shallow pits, irregular in both size and shape and surrounded by curved ridges narrower than the pits, the whole forming a honeycomb arrangement. There are usually a series of 5 and 6 pits in a line 10 mm. long. The sculpturing is less distinct on the neurals and proximal ends

of the costals. On the outer halves of most of the costals there is a tendency for the pits to arrange themselves in rows parallel with the axis of the shell. The outer beveled edge of the costals is free from ornamentation. In addition to the pits and ridges, the shell of the adult is ornamented by a series of longitudinal welts. These are most conspicuous on the posterior part of the shell as indicated in figure 1. In the type the seventh and eighth costals are crossed by no less than seven of these welts. The one paralleling the neurals on the left side extends forward as far as the third costal. The welts resemble those found in the shells of certain species of *Plastomenus* and *Trionyx*. They are absent in the juvenile specimens.

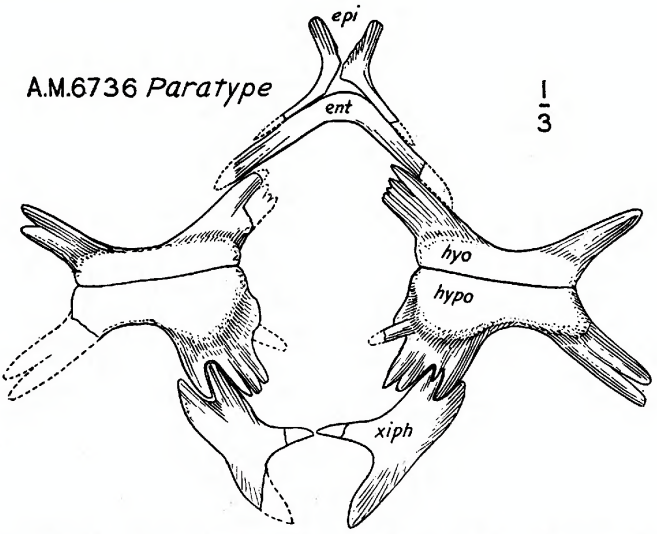

Fig. 4. Plastron of *Amyda gregaria*, new species. Paratype. Juvenile. A. M. No. 6736. One-third natural size.

Ent, entoplastron; *epi*, epiplastron; *hyo*, hyoplastron; *hypo*, hyhoplastron; *xiph*, xiphiplastron.

All of the plastron elements are present in the type. The plastron (see Fig. 3) encloses large median fontanels. The bridge, where narrowest, is 35 mm. wide, of which 21 mm. belong to the hypoplastron. The limbs of the entoplastron are 81 mm. long and unite to form less than a right angle. The hypoplastral suture is 82 mm. long. The xiphiplastron is 80 mm. long and about 34 mm. broad.

In the young, the plastron is remarkable for the narrowness of the bridge and the depth of the notch between the outer process of the hyoplastron and that of the hypoplastron, as well as the relatively greater

length of the finger-like processes of these bones. It is quite evident that, with advancing age, the bone grows out to fill much of this notch, thus reducing the length of the processes. This change is clearly indicated in figures 3 and 4. The xiphiplastron in this species differs from any described species of *Amyda* in that its two elements meet on the median line by a single slender, sharply pointed process, instead of the usual two interdigitating processes. The form of the various plastral elements of both juvenile and adult individuals is clearly shown in figures 3 and 4. The sculpture of the plastral bones is finer and more regular in its pattern than on the carapace.

Specimen A. M. No. 6735 consists of the skull and lower jaws, incomplete skeleton and shell, but the skull is fairly complete and serves as a fine example for depicting the features of the cranium since most of the sutures can be clearly traced, as shown in figures 5 and 6.

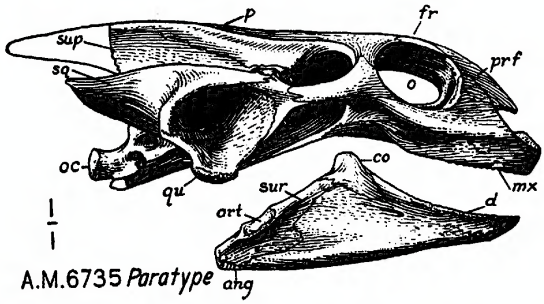

Fig. 5. Skull of *Amyda gregaria*, new species. Paratype. A. M. No. 6735. Lateral view. Natural size.

Ang, angular; *art*, articular; *co*, coronoid; *d*, dentary; *fr*, frontal; *mx*, maxillary; *o*, orbit; *oc*, occipital condyle; *p*, parietal; *prf*, prefrontal; *qu*, quadrate; *sq*, squamosal; *sup*, supraoccipital; *sur*, surangular.

The length of the skull from the tip of the snout to the occipital condyle is 55 mm.; the greatest width at the upper posterior border of the tympanic cavity is 34.5 mm. From the fronts of these cavities the skull gradually narrows to the bluntly rounded snout. Viewed laterally the face drops rapidly in front of the orbits as in *Amyda mira* Hay.

The tympanic chambers are large, the antero-posterior dimensions being 11 mm., dorso-ventrally 8.5 mm. The orbits are large and subround, having a greatest diameter of 10.5 mm. The interorbital space is 5 mm. wide. The snout projects 13 mm. beyond the orbits. Length of supratemporal fossae less than the longitudinal diameter of orbit. Orbit nearer the temporal than the nasal fossa.

The pterygoid portion of the palate has a width of 20 mm. The middle of the choanae is about the middle of the orbit. The triturating surfaces of the upper jaws opposite the posterior border of the choanae are 6 mm. wide but gradually narrow anteriorly.

Most of the sutures of the skull can be clearly traced as shown in figures 5 and 6, but they show no characteristics that would serve to distinguish the skull from other described species.

Comparison of the vertebrae, girdle, limb and foot bones with the homologous parts of other trionychids, both living and extinct, failed to

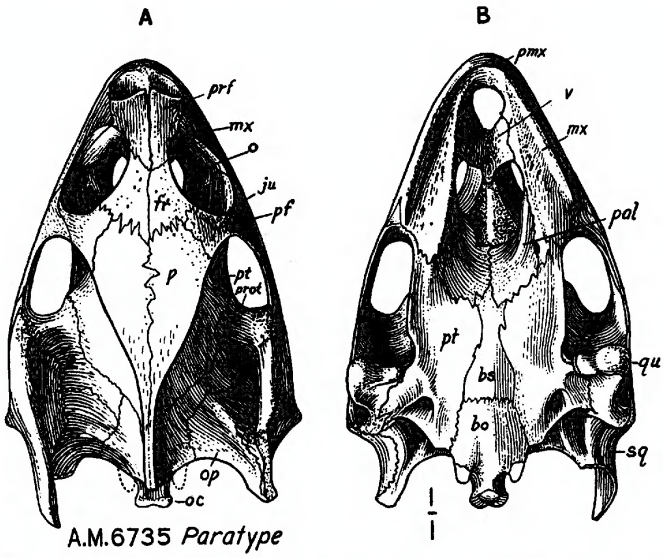

Fig. 6. Skull of *Amyda gregaria*, new species. Paratype. A. M. No. 6735. Natural size.

A, superior view; B, inferior view. *Bo*, basioccipital; *bs*, basisphenoid; *fr*, frontal; *ju*, jugal; *mx*, maxillary; *o*, orbit; *oc*, occipital condyle; *op*, opisthotic; *p*, parietal; *pal*, palatine; *pf*, postfrontal; *pmx*, premaxillary; *prf*, prefrontal; *prot*, proötic; *pt*, pterygoid; *v*, vomer; *qu*, quadrate; *sq*, squamosal.

disclose characters that would serve to further distinguish the present species.

In form and arrangement of the carapace elements, the present species has its nearest resemblance to *Amyda egregia* Hay[1] from the Eocene (Bridger) of Wyoming. The smaller size of *Amyda gregaria*, relatively shorter nuchal, finer character of ornamentation and greater lateral development of the eighth pair of costals, would at once distinguish it.

[1]Hay, O. P. 1908. 'Fossil Turtles of North America,' Carnegie Institution of Washington, p. 531.

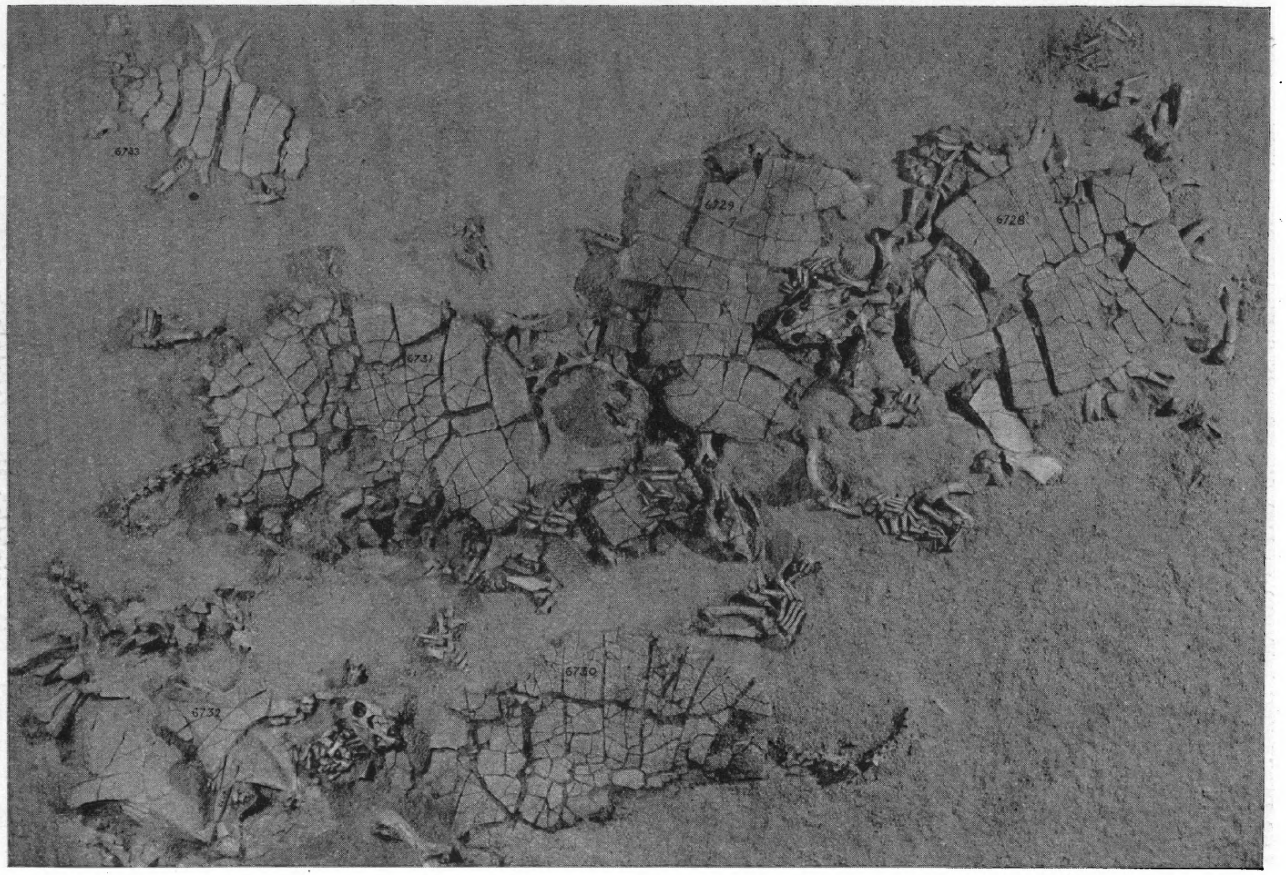

Fig. 7. Slab showing several specimens of *Amyda gregaria*, new species, as they were found in the field and as now exhibited in the American Museum of Natural History. A. M. Nos. 6728, 6729, 6730, 6731, 6732 and 6733 (young). About one-sixth natural size.

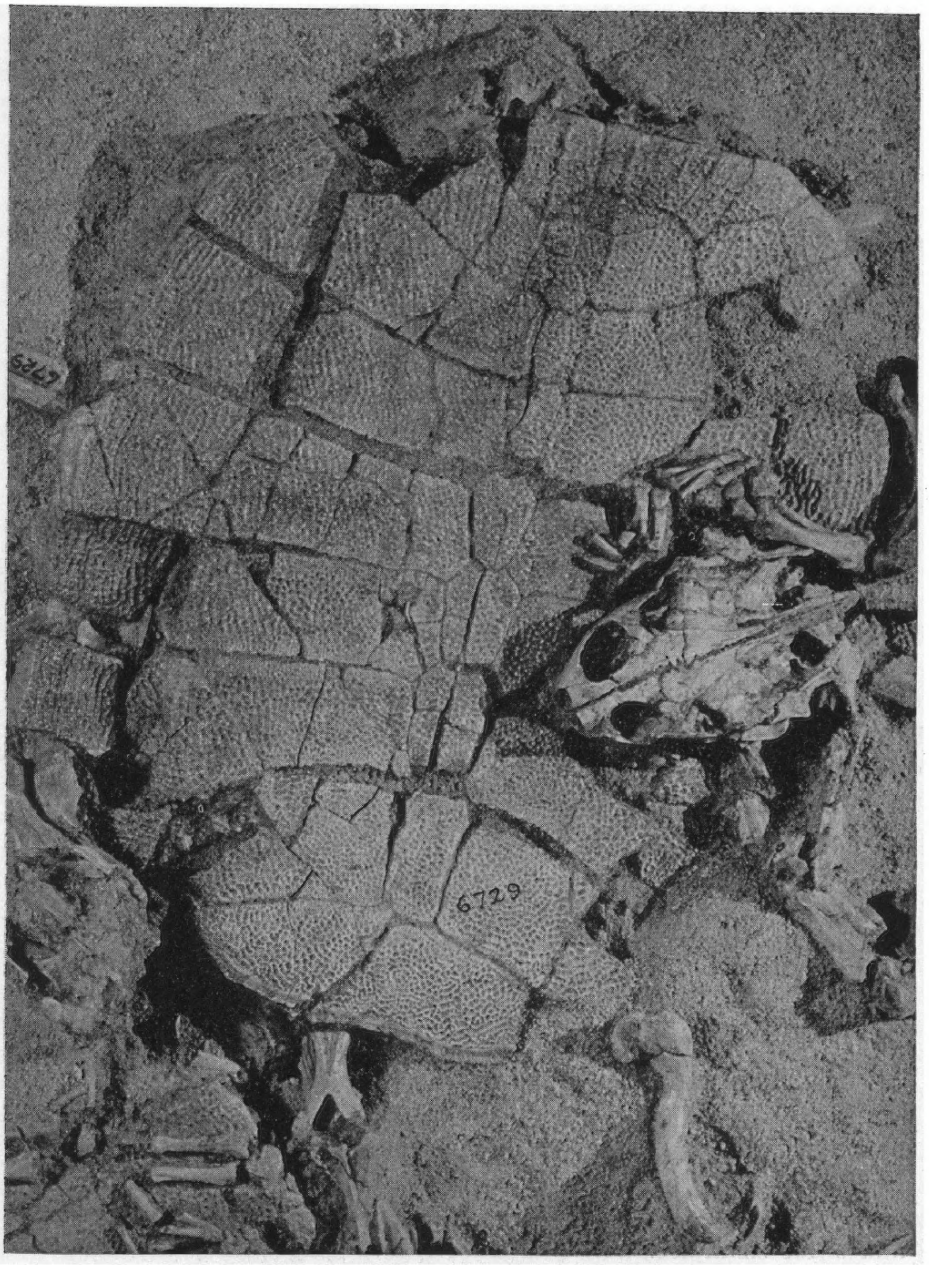

Fig. 8. Specimen of *Amyda gregaria*, new species. A. M. No. 6729. To illustrate the character of the ornamentation, as all of the specimens are in close agreement. About one-half natural size.

NOTES ON JUVENILE SPECIMENS

A few of the modifications that take place in the form and structure of the trionychid carapace and plastron during the growth of the individual are beautifully illustrated by the present series of specimens. So striking are some of these changes between young and adult individuals, that had the present specimens been found wide apart there would have been little possibility of their recognition as pertaining to the same species.

That the two juveniles, A. M. Nos. 6733 and 6736, are the young of the larger specimens of the present aggregation is quite certainly indicated not only by their smaller size, but by their association in the field, by the similarity of the sculpturing, and especially by the close correspondence in all particulars of the skulls and various skeletal parts.

The immaturity of the two specimens (A. M. Nos. 6733 and 6736) is shown by the open sutures, the strongly protruding rib ends, and the loose attachment of the nuchal bone. This element in the juvenile specimens shows no indication of bony attachment with the carapace, whereas in the larger and older individuals it is suturally joined along the entire posterior border. Furthermore, when the nuchal of the young is placed in position (see Fig. 2), it overlaps the rib ends of the first costals, while in the adult the outward expansion of the first costals leaves the nuchal entirely inside the rib ends (see Fig. 1). At the same time there is a decided modification in the form of the nuchal ends from a wide digitate termination to a triangular pointed extremity as shown in figures 1 and 2. The superior surface of the adult nuchal is completely sculptured, whereas in the juvenile only a small angularly rounded patch near the center of the bone is ornamented, the remaining surface being smooth.

With advancing age the rear of the carapace also undergoes striking changes. The rounded end with median notch of the juvenile becomes in the adult widely truncate, while the greatly reduced seventh and eighth pairs of costals increase decidedly in size.

Further substantiation of the identity of these young and adult forms is furnished by a series of specimens of *Trionyx muticus* from the Mississippi Valley in the United States National Museum, which display almost precisely similar modifications of the carapace between young and adult examples.

The changes in the plastron have been mentioned elsewhere. Comparison of the skull, vertebrae, girdle and limb bones shows no differences between juvenile and adult except the smaller size and less well defined processes and articular ends in the young.

These modifications in structure of the carapace brought about by growth of the individual, show that great care is necessary in order not to fall into error in a study of the fossil Trionychidae. In fact, in the light of the information furnished by the present assemblage of turtles, I am of the opinion that some of our described species were based upon specimens not fully adult, and for that reason the characters used to distinguish them cannot be relied upon as being constant.

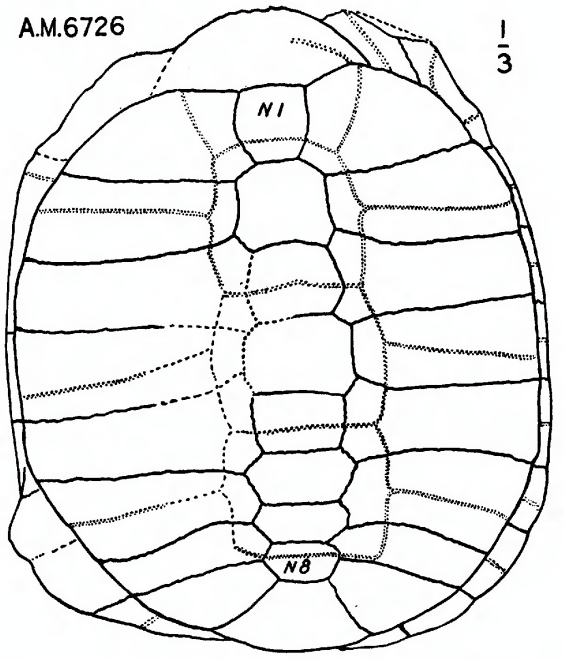

Fig. 9. Carapace of *Testudo shensiensis* Wiman. A. M. No. 6726. One-third natural size. N_1, N_8, neurals one and eight respectively.

Family **TESTUDINIDAE**

Testudo cf. **shensiensis** Wiman

WIMAN, CARL. 1930. Palaeontologia Sinica, VI, pt. 3, pp. 28–33, Pl. v, figs. 1–16.

Three specimens, A. M. Nos. 6725, 6726 and 6727, collected from the Tung Gur formation at Wolf Camp, Gur Tung Khara Usu, Inner Mongolia, by the 1930 Central Asiatic Expedition, are provisionally identified as pertaining to *Testudo shensiensis* Wiman. No question can be raised as to this generic assignment, but imperfect preservation and our present lack of knowledge concerning the range of variation that may occur within a species of the Testudinata leave the specific allocation somewhat uncertain.

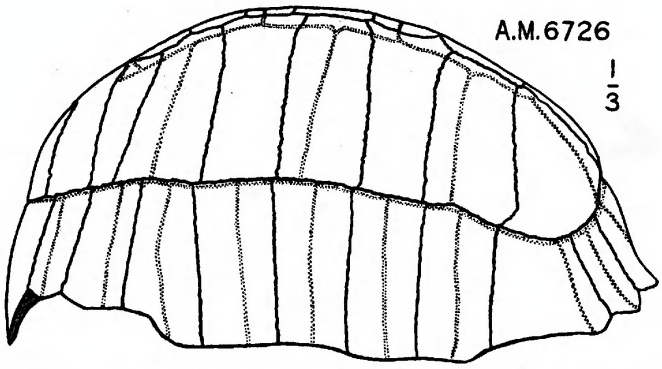

Fig. 10. Carapace of *Testudo shensiensis* Wiman. A. M. No. 6726. Viewed from the right side. One-third natural size.

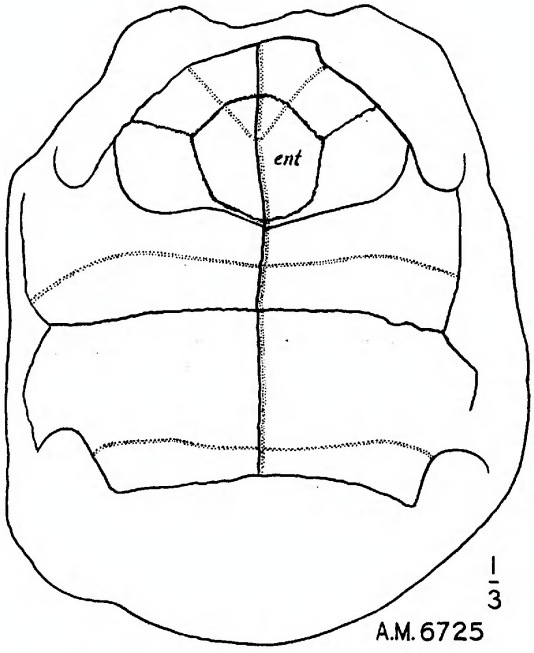

Fig. 11. Plastron of *Testudo shensiensis* Wiman. A. M. No. 6725. One-third natural size.

Ent, entoplastron.

Specimen A. M. No. 6727 has all of its detailed structure obliterated and is therefore valueless from a systematic standpoint. A. M. No. 6726 has the carapace fairly well preserved, but the plastron is almost entirely missing; A. M. No. 6725 has the carapace less well preserved, but the plastron lacking the posterior lobe is present. From this brief review of the available specimens, the difficulty of properly contrasting them is at once apparent. Quite certainly, however, all three are specifically the same.

In the general form of the high vaulted shell, having both the height and width greater than one-half the length, the greatest height at about mid-length; the rear steeply sloped with the pygal region extending downward below the level of the plastron; the costals alternately wide and narrow at their ends; the entoplastron pentagonal with the pectoral-humeral sulcus crossing behind it, are all features held in common with the type of *Testudo shensiensis* Wiman.

The specimens before me differ from that species in being slightly larger, and in the shape and arrangement of the neural bones; for example, in specimen A. M. No. 6726 the second and fourth neurals are octagonal, the third and sixth hexagonal, whereas in the type of *T. shensiensis* the second is octagonal, the third tetragonal, the fourth and sixth hexagonal. There are also slight differences in the shape and proportions of the vertebral scutes, as shown in the accompanying table.

COMPARATIVE MEASUREMENTS OF NEURALS

	Length		Width	
No.	A. M. No. 6727	Type of *Testudo shensiensis*	A. M. No. 6726	Type of *Testudo shensiensis*
	mm.	mm.	mm.	mm.
1	38	26	29	21
2	30	24	36	35
3	29	23	34	30
4	25	24	34	34
5	25	20	34	33
6	21	17	41	30
7	15	13	37	27
8	20	12	25	23

COMPARATIVE MEASUREMENTS OF VERTEBRALS

No.	Length			Width		
	A. M. No. 6726	A. M. No. 6725	Type of *Testudo shensiensis*	A. M. No. 6726	A. M. No. 6725	Type of *Testudo shensiensis*
	mm.	mm.	mm.	mm.	mm.	mm.
1	58	58	48	67	63.5	64
2	67	50	47	67	55	50
3	62		46		60	55
4			43		60	47
5			50		....	73

In view of the fact that the neural series as illustrated by Wiman is not bilaterally symmetrical, and also that the observed differences are not greater than occur among individuals of *Stylemys nebrascensis* Leidy that are regarded by American authorities as being variations well within the limits of a species, the reference of the specimens before me to *Testudo shensiensis* seems to be a logical assignment.

In this connection it is pertinent to call attention to the possibility that Doctor Wiman may have erred in establishing six species of *Testudo* all from practically the same geological horizon. A review of his paper convinces me that many of the characters used are not sufficient to properly distinguish them, and that with the acquisition of more specimens it will be found that the number of species will be reduced.

Trionychids Indet.

Two small carapace fragments collected by the 1930 Asiatic Expedition of The American Museum of Natural History, east of Irdin Manha, Mongolia, are the first record of a trionychid turtle in the Arshanto formation, Lower Eocene.